Course Outline: Winter 2013

University of Saskatchewan
Department of Mathematics and Statistics

NUMERICAL ANALYSIS I (MATH 211)

Instructor:	Dr. Raymond J. Spiteri
Office:	THORV S425
e-mail:	raymond.spiteri@usask.ca
Course Website:	`http://www.cs.usask.ca/~spiteri/m211.html`

Prerequisites:	MATH 110 (Calculus I) and MATH 116 (Calculus II).
Text:	Michael Heath, *Scientific Computing, An Introductory Survey*, 2nd ed. McGraw–Hill, 2002.
Lecture Notes:	Lecture notes are provided on the course website; however, they are not a substitute for attending class.

Overview: This course is about numerical computing using Matlab. Numerical computing is primarily concerned with the computer solution of mathematically formulated problems. Matlab is a *problem-solving environment* that allows students to enhance important problem-solving and computer skills that form the basis for a state-of-the-art training in science or engineering. These are essential skills for those seeking careers in academia or high-tech industry. Experience with Matlab is a marketable skill (i.e., you can put it on your resume!) that is often required by companies in their job ads.

Lecture Topics:

1. Introduction to Matlab and Numerical Computing

    (a) Matlab basics
    (b) Floating-point arithmetic

2. Solving Systems of Linear Equations

    (a) Gaussian elimination, **LU** decomposition, pivoting; effects of round-off error
    (b) Norms and condition numbers; accuracy and stability of numerical algorithms

3. Interpolation

    (a) Polynomial interpolation
    (b) Piecewise polynomial (spline) interpolation

4. Solving Nonlinear Equations

    (a) Methods for solving single nonlinear equations
    (b) Methods for solving systems of nonlinear equations

5. Numerical Integration

    (a) Quadrature (numerical solution of definite integrals); adaptive quadrature
    (b) Numerical solution of initial-value problems for ordinary differential equations; stiffness

Method of Evaluation: Assigned Course Work and Relative Marking Weights:

- Assignments (5): 20% (due every 2-3 weeks; short written answers and some Matlab programming)
- Mid-term Test: 25% (Thursday, February 28, 2013, in class)
- Final Exam: 55%

Rules and Regulations:

- All students must be properly registered in order to attend lectures and receive credit for this course.
- Failure to complete the assigned course work or to write the final examination will result in a failing grade for the course.
- Failure to obtain a mark of at least 40% on the final examination will result in a failing grade for the course.
- The course website lists other regulations regarding examinations, assignments, and academic honesty.